

### **REMARKS/ARGUMENTS**

In the Office Action, the Examiner rejected claims 1-16 under 35 U.S.C. 102(b) as being anticipated by *DiStefano* (U.S. Pat. No. 6,127,724). The Applicants respectfully traverse the rejections for the reasons set forth below. Reconsideration is respectfully requested based on the remarks below.

Claims 2, 5, and 6 have been amended to further clarify the claimed subject matter. At least some of the amendments spell out concepts that were inherent in the original claims and therefore do not narrow the claims. Support for the amendments can be found in the specification on page 15, lines 18-25; original claims 2, 5, 6; Figs. 3A-3B; and elsewhere. Claims 17-36 have been canceled without prejudice. New claims 37-40 have been added. Accordingly, claims 1-16 and 37-40 are now pending in this application.

### **ELECTION OF INVENTIONS**

Applicants hereby affirm the election of Group I, claims 1-16.

### **PATENTABILITY OF CLAIMS 1-16**

Claim 1 recites a semiconductor package comprising "a die, a wire bonding packaging substrate, a plurality of interconnects, a molding interface material, and a molding cap." In particular, claim 1 recites "a molding interface material applied to at least a portion of the die"; "a molding cap covering at least a portion of the die, packaging substrate, interconnects, and molding interface material"; and "a die having a plurality of layers of low-K dielectric material." As explained fully below, the cited art (particularly the *DiStefano* patent relied on by the Examiner) simply does not show or suggest the two separate elements of a molding interface material and a molding cap. Further, the cited art clearly does not show or suggest a die having a plurality of layers of low-K dielectric material.

The packages of the present invention include dice covered with molding interface materials that can control the considerable pressures caused by the CTE mismatch between the various components in the packages. In some aspects, the packages of the present invention include a molding interface material that is applied between the low-K Si die and the molding compound such that the molding interface material strengthens the structural integrity of the low-K Si die and/or the molding interface material redistributes the packaging stress caused by the CTE mismatch between the various components of the wire bonding package (e.g., molding compound, substrate, silicon portion of the die, low-K dielectric portion of the die, die attach

pad, etc.). As such, the molding interface material provides sufficient flexibility and support to counter the inherent package stresses of the CTE mismatch (e.g., caused from temperature cycling during reliability thermal cycle testing and during industrial grade testing that ranges from -55°C to 125°C) without causing any layer of the low-K materials to delaminate or crack. (See page 7, line 26 to page 8, line 7)

*DiStefano* describes a semiconductor chip assembly. In particular, a semiconductor chip 32 is mounted in face-up disposition on a dielectric element 20, with thermally conductive but flexible elements 50 disposed between the chip bottom surface 36 and the top surface 22 of the dielectric element 20 so as to provide a compliant but thermally conductive path from the chip 32 to a substrate 66 which is bonded to the terminals 62. A spreader 60 having coefficient of thermal expansion substantially equal to that of the chip 32 overlies the front surface and constrains an encapsulant 58 surrounding the leads 54 so as to minimize shear deformation of the encapsulant 58. (See Abstract; FIG. 1)

In contrast, claim 1 specifies "a molding interface material applied to at least a portion of the die" and "a molding cap covering at least a portion of the die, packaging substrate, interconnects, and molding interface material." *DiStefano* employs no structure that corresponds to the molding interface material in combination with the molding cap. It is therefore submitted that claim 1 is patentable over *DiStefano*.

In rejecting claim 1, the Examiner states that (in the context of *DiStefano* Figure 7) that the molding cap corresponds to element 459, which is the side of encapsulant 458. However, it is unclear whether the Examiner states that (in the context of *DiStefano* Figure 7 and column 13, lines 55-65) the molding interface material corresponds to the spreader 360/460 or to the encapsulant 358/458. Nevertheless, the spreader 360/460 cannot correspond to the molding interface material since claim 1 requires having the "molding interface material applied to at least a portion of the die," which the spreader 360/460 clearly does not do as shown in Figure 6/7. Further, the encapsulant 358/458 cannot correspond to the molding interface material if element 459 (side of encapsulant 458) already corresponds to the molding cap, which is a separate structural element recited in claim 1. As shown in Figures 6 and 7, elements 358, 458 and 459 refer to the same structural element, i.e., the encapsulant. As such, claim 1 cannot be rejected based on the element references and statements made by the Examiner.

Moreover, claim 1 specifies "a die having a plurality of layers of low-K dielectric material." For instance, such a die may be referred to as a "low-K Si die" or an "extra low-K Si die," which are both well known to those skilled in the art as having different properties from that of a conventional Si die. (See page 8, line 21 to page 9, line 22) Applicants note that the

Examiner has identified *DiStefano* Figure 7, element 432, as relevant to this claim limitation. However, *DiStefano* fails to teach or disclose that element 432 is more than a conventional chip or die. (See column 12, line 27-28) In fact, nowhere in the cited art is there any mention of a die having a plurality of layers of low-K dielectric material. Therefore, it is respectfully submitted that claim 1 is patentably distinct from the cited art also on this basis.

The Examiner's rejections of the dependent claims are respectfully traversed. However, to expedite prosecution, all of these claims will not be argued separately. Claims 2-16 each depend either directly or indirectly from independent claim 1 and, therefore, are respectfully submitted to be patentable over cited art for at least the reasons set forth above with respect to claim 1. Further, the dependent claims require additional elements that when considered in context of the claimed inventions further patentably distinguish the invention from the cited art.

For example, claim 16 specifies "wherein the plurality of layers includes extra low-K dielectric material." In rejecting claims 16, the Examiner took Official Notice that facts outside of the record are "well-known" in the art. In particular, Official Notice is taken when the Examiner states that polyimide is known in the art to be low-K dielectric material. The Applicants respectfully traverse all assertions of Official Notice and request that the Examiner cite references, which would support the assertions of Official Notice.

In view of the above, it is respectfully requested that the Examiner withdraw the rejection of claims 1-16 under 35 U.S.C § 102(b).

#### NEW CLAIMS


New claims 37-40 are believed to be patentable over the art of record for much the same reasons as claim 1. Claim 37 recites, "wherein the molding interface material is a layer positioned between and in contact with the die and the molding cap." Claim 38 recites, "wherein the plurality of low-K dielectric material has a CTE between the range of 20 ppm and 50 ppm." In addition, claim 39 recites "wherein the plurality of low-K dielectric material has a dielectric constant between 2.6 and 3.5" and claim 40 recites "wherein the plurality of low-K dielectric material has a dielectric constant between 2.2 and 2.6." Support for the new claim 37 may be found in FIG. 2, FIG. 5, and elsewhere. Support for the new claims 38-40 may be found in the specification on page 8, line 21 to page 9, line 22, and elsewhere.

**CONCLUSION**

It is respectfully submitted that all pending claims are allowable and that this case is now in condition for allowance. Should the Examiner believe that a telephone conference would expedite the prosecution of this application, the undersigned can be reached at the telephone number set out below.

If any fees are due in connection with the filing of this Amendment, the Commissioner is authorized to deduct such fees from the undersigned's Deposit Account No. 50-0388 (Order No. ALTRP100).

Respectfully submitted,  
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